

ABSTRACT

An apparatus for measurement, manipulation and encapsulation or extraction of material from particles, particularly cells. The apparatus can also be used for measuring the electro-mechanical properties of cells, optical properties of cells, interior structure of the cell, for
5 differentiating cells on the basis of surface markers and for cell poration using electric field or electromagnetic radiation. Optical including fluorescent emission, scatter intensity and pulse duration, and impedance measurements at multiple frequencies using multiple optodes, electrodes and conventional Coulter electrodes are made simultaneously using an integrated sensor. Cells are suspended in a fluid whose electromagnetic properties and optical properties
10 are different from that of the cells. Cells are made to pass through a constricted path and thereby cause a measurable change on any of the electrodes or optodes monitoring the constricted volume. Optical elements are placed in a non-encircling arrangement around the constricted volume.

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